IN THE UNITED STATES PATENTS AND TRADEMARK OFFICE

Appln No.	:	10/568,967
Confirm. No.:		8880
Applicant(s):		Hideo Taka et al.
Filed	:	March 14, 2006
For	:	ORGANIC ELECTROLUMINESCENT...
Art Unit	:	1794
Examiner	:	MICHAEL H. WILSON
Docket No.	:	06096/HG
Customer No.:		01933

DECLARATION UNDER 37 CFR 1.132

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

I, Hideo Taka, hereby declare and say as follows:

That I received a Doctorate of Science from Tokyo Metropolitan University in 2000.

That since 2003, I have been employed by Konica Corporation, now named as Konica Minolta Holdings Inc., the Assignee of the above-referenced application, and have been engaged in the research and development in the field of organic light-emitting device.

That I am one of the inventors of the present application.

That I am familiar with the subject matter of the present invention.

The following experiments were carried out by Hideo Taka, one of the inventors of the present application.

Experimental

A first purpose of the present experiments is to provide supplemental examples showing that, when one or more substituents or an additional divalent group incorporated in the main chain of the polymer is added to the polymer of Poly-13, the properties of the obtained polymer as an organic EL element when the polymer is used in the light emission layer are improved compared to the properties of Poly-13 itself, in addition to such examples given in Tables 5 and 7 in pages 106-107 of the Specification, in Table 5-continued and Table 7-continued in the 1.132 declaration submitted on November 24, 2009. Poly-13 is one of the simplest polymers

of the present Application, in which a simple carbazolyl group is pendent to a polyphenylether chain having no substituent.

A second purpose of the present experiments is to examine the properties of a polyphenylether polymer without a pendant having a functional group when used in the light emission layer of an organic EL element, in order to make it possible to compare those properties with the properties of the inventive and comparative polymers having a pendant containing a functional group.

With respect to the first purpose of the present Experimants, the following polymers were tested:

Poly-17 in page 52 of the Specification, in which an iso-octoxy group was substituted for hydrogen in the phenylene group of Poly-13;

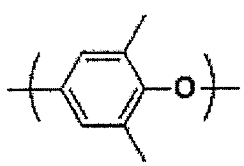
Poly-16 in page 51 of the Specification, in which a methyl group was substituted for hydrogen in the phenylene group of Poly-13;

PO-9 in page 49 of the Specification, in which a 2-pyridyl group was substituted for hydrogen in the phenylene group of Poly-13 and the carbazolyl group of Poly-13 was replaced with a phenylcarbazolyl group;

PO-10 in page 49 of the Specification, in which a 3-pyridyl group was substituted for hydrogen in the phenylene group of Poly-13 and the carbazolyl group of Poly-13 was replaced with a phenylcarbazolyl group; and

PO-14 in page 49 of the Specification, in which a phenyl group was substituted for hydrogen in the phenylene group of Poly-13 and the carbazolyl group of Poly-13 was replaced with a phenyldiazacarbazolyl group.

With respect to the second purpose of the present Experiment, PO-1 in page 24 of the Specification, and PO-21 as shown below were tested.



PO-21

Further, the following polymers were also tested:

Poly-14 in page 51 of the Specification, in which the divalent oxygen atom of Poly-13 was replaced with a divalent sulfur atom; and

Poly-30 in page 55 of the Specification, in which the p-phenylene group of Poly-13 was replaced with an m-phenylene group.

<Preparation of organic EL elements>

A pattern was formed on a substrate (100 mm x 100 mm x 1.1 mm) composed of a glass plate and a 100 nm ITO (indium tin oxide) layer (NA45 manufactured by NH Technoglass Co., Ltd.) as an anode. Then the resulting transparent substrate having the ITO transparent electrode was subjected to ultrasonic washing in i-propyl alcohol and dried by a dry nitrogen gas and subjected to UV-ozone cleaning for 5 minutes. 30 mg of polyvinylcarbazole (PVC) and 1.8 mg of Ir-1 were dissolved in 1 ml of dichlorobenzene and spin coated on thus obtained transparent substrate at 1000 rpm for 5 seconds (thickness: around 100 nm), followed by vacuum drying at 60°C for 1 hour to form a light emitting layer.

The substrate was fixed in a vacuum deposition apparatus and the pressure in the vacuum tank was reduced to 4×10^{-4} Pa. Then, a 0.5 nm thick lithium fluoride layer as a cathode buffer layer and a 110 nm thick aluminum layer as the cathode were deposited, followed by sealing with glass. Thus, Organic EL element 2-1-1 was prepared.

Organic EL elements 2-1-20 through 2-1-28 were prepared in the same manner as organic EL element 2-1-1, except that PVK and Ir-1 used in the light emitting layer were changed to

the compounds listed in Tables 5-continued-2 and 7-continued-2.

<Evaluation of organic EL elements>

On the above Organic EL elements, the following evaluation was carried out.

(External Quantum Efficiency)

Electric current of 2.5 mA/cm^2 was supplied to each sample at 23° C in an atmosphere of a dry nitrogen gas, and the external quantum efficiency (%) of each sample was measured. The external quantum efficiency (%) was calculated from the date obtained by being measured through a spectral radiance meter CS-1000 produced by Konica Minolta Sensing Inc.

(Emission life)

Electric current of 2.5 mA/cm^2 was supplied to each sample at 23° C in an atmosphere of a dry nitrogen gas, and measured was the duration in which the luminance of each sample decreased to half of the initial luminance, which was designated as the half life of emission ($\tau 0.5$) and used as an index of emission life. The measurement was carried out using a spectral radiance meter CS-1000 produced by Konica Minolta Sensing Inc.

(Driving voltage)

The voltage at which emission started was measured at 23°C in an atmosphere of a dry nitrogen gas. The voltage at which emission started was determined by measuring the voltage at which the luminance increased to 50 cd/m^2. The measurement of luminance was carried out using a spectral radiance meter CS-1000 produced by Konica Minolta Sensing Inc.

The values of External quantum efficiency, Emission life, and Driving voltage for organic EL elements 2-1-20 through 2-1-28 were listed in Table 7-continued-2 as relative values when each value of organic EL element 2-1-1 was set to 100.

Results

The obtained organic EL element properties were summarized in following Table 5-continued-2 and Table 7-continued-2.

Table 5-continued-2

Organic EL Element	Light emitting layer	Number average molecular weight of polymer	Remarks
2-1-1	PVK/Ir-1	110,000	Comparative
2-1-20	POly-14/Ir-1	1,600	Inventive
2-1-21	Poly-17/Ir-1	13,000	Inventive
2-1-22	Poly-16	22,000	Inventive
2-1-23	Poly-30	6,500	Inventive
2-1-24	PO-9/Ir-1	21,000	Inventive
2-1-25	PO-10/Ir-1	19,000	Inventive
2-1-26	PO-14/Ir-1	18,000	Inventive
2-1-27	PO-21/Ir-1	25,000	Reference
2-1-28	PO-1/Ir-1	20,000	Reference

Table 7-continued-2

Organic EL element	External quantum efficiency (Relative value)	Emission Life (Relative value)	Driving voltage (Relative value)	Remarks
2-1-1	100	100	100	Comparative
2-1-20	115	145	91	Inventive
2-1-21	123	181	92	Inventive
2-1-22	151	293	91	Inventive
2-1-23	118	160	92	Inventive
2-1-24	242	590	71	Inventive
2-1-25	251	614	73	Inventive
2-1-26	227	700	73	Inventive
2-1-27	101	150	98	Reference
2-1-28	103	110	93	Reference

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable

by fine or imprisonment, or both, under Section 1001, of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dated: June 9, 2010 Hideo Taka

Hideo Taka